

NON-PUBLIC?: N
ACCESSION #: 9011190289
LICENSEE EVENT REPORT (LER)

FACILITY NAME: McGuire Nuclear Station, Unit 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000369

TITLE: A Solid State Protection System General Warning Reactor Trip
Occurred On Unit One Because Of An Equipment Failure/Malfunction
EVENT DATE: 10/13/90 LER #: 90-027-00 REPORT DATE: 11/12/90

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Alan Sipe, Chairman, McGuire TELEPHONE: (704) 875-4183
Safety Review Group

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JC COMPONENT: IS MANUFACTURER: W120
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On October 13, 1990, at 1033, Unit 1 experienced a Reactor Trip/Turbine Trip. Unit 1 was in Mode 1, Power Operation, at 100 percent power at the time of this event. The first out (FO) annunciator indicated an "SSPS General Warning - Rx Trip." Prior to the Reactor Trip, Instrumentation and Electrical (IAE) personnel were performing the bi-monthly periodic test on the Solid State Protection System (SSPS) Train B. The "General Warning" signal was generated because of the failure/malfunction of a Reactor Trip Breaker cell switch. The only Safety System Actuation that occurred as a result of the trip was the start of the Auxiliary Feedwater (CA) pumps. Operations (OPS) personnel implemented the Reactor Trip/Safety Injection procedure and then entered the Reactor Trip procedure. OPS personnel implemented the Unit Fast Recovery procedure to recover from the Reactor Trip. At 1200, OPS personnel made the required notification to the Nuclear Regulatory Commission (NRC). IAE personnel

replaced the failed cell switch. OPS Control Room personnel returned Unit 1 to Mode 1 (Power Operation) on October 14, 1990, at 1825. This event has been assigned a cause of Equipment Failure/Malfunction because of the failed cell switch. This event is Nuclear Plant Reliability Data System reportable and Part 21 reportable. The switch will be sent offsite for further failure analysis.

END OF ABSTRACT

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EVALUATION:

Background

The SSPS takes digital inputs (voltage/no voltage) from the 7300 Process Control System and nuclear instrument channels EIIS:CHA! corresponding to conditions (normal/abnormal) of unit parameters. The system combines these signals in the required logic combination and generates a trip signal (no voltage) to the undervoltage coils of the Reactor EIIS:RCT! Trip Circuit Breakers EIIS:72! when the necessary combination of signals occur. The system also provides annunciator EIIS:ANN! status light

EIIS:IL! and computer EIIS:CPU! input signals which indicate the condition of bistable input signals, partial trip and full trip functions and the status of the various blocking, permissive EIIS:69! and actuation functions.

The Reactor Trip switchgear EIIS:SWGR! consists of two Reactor Trip Breakers, RTA and RTB, and two Bypass Breakers, BYA and BYB. The Reactor Trip Breakers are connected in series with both motor-generator (MG) EIIS:MG! sets so that opening either Breaker interrupts power to all control rod drive mechanisms, permitting the rods to free fall into the core. The Reactor Trip Breakers are actuated by two separate logic matrices of the SSPS, with Train A controlling breaker RTA and Train B controlling Breaker RTB. The Bypass Breakers are used during testing of the Reactor Trip Breakers. Bypass Breaker BYA, which is controlled by Train B logic of the SSPS, is used to Bypass Reactor Trip Breaker RTA. Bypass Breaker BYB, which is controlled by Train A logic of the SSPS, is used to Bypass Reactor Trip Breaker RTB.

Technical Specification (TS) Action Statement No. 14, Table 3.3-3 states:

"With the number of operable channels one less than the minimum channels operable requirement, be in at least Hot Standby within 6 hours and in Cold Shutdown within the following 30 hours; however,

one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.2.1, provided the other channel is operable."

Description of Event

On October 13, 1990, at 1033, Unit 1 experienced a Reactor Trip/Turbine EIIS:TRB! Trip while in Mode 1 (Power Operation) at 100 percent power. The FO annunciator, which indicates what caused the Reactor Trip, displayed "SSPS General Warning - Rx Trip." Prior to the trip, Instrumentation and Electrical (IAE) personnel were performing the bi-monthly periodic test (PT) on the SSPS Train B per procedure PT/0/A/4601/08B, "Solid State Protection System (SSPS) Train B Periodic Test with NC System Pressure > 1955 PSIG", under work request (WR) 03284C. The purpose of the PT was to test the time response of the Main and Bypass Reactor Trip Breakers.

As part of the testing process, IAE personnel were testing RTB and BYA. At the start of the test, the Reactor Trip Breaker configuration was RTA,

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connected and closed; RTB, connected and closed; BYB, connected and closed; and BYA, in the "test" position. To test the time response of the RTB and BYA, it was necessary to close BYA in the test position. When this was done, the recorder EIIS:ER! used to measure the time response trace did not trigger; therefore, it was necessary to close BYA again. While IAE personnel were attempting to close BYA a second time, Train A of the SSPS received an "SSPS General Warning" alarm. Since Train B was already showing a "General Warning" alarm as part of the SSPS test, the signal caused RTA, RTB, and BYB to trip (open) causing the Unit 1 Reactor to trip. The only Safety System Actuation that occurred as a result of the trip was the start of the CA pumps EIIS:P! which were initiated by a Lo-Lo Steam Generator (S/G) EIIS:SG! level on S/G B.

OPS Control Room EIIS:NA! personnel implemented procedure EP/1/A/5000/01, Reactor Trip or Safety Injection, and then entered procedure EP/1/A/5000/1.3, Reactor Trip. OPS Control Room personnel then implemented procedure OP/1/A/6100/05, Unit Fast Recovery. At 1142, OPS Control Room personnel complied with TS Action Statement No. 14 of Table 3.3-3 since SSPS Train B was not returned to service within the required 2 hours. Unit 1 was already in Mode 3 (Hot Standby) at that time. At approximately 1200, the NRC was notified as required per procedure RP/1/A/5700/10, NRC Immediate Notification Requirements.

After some discussion with Maintenance Engineering Services (MES), OPS,

and IAE personnel, IAE personnel began troubleshooting the exact cause of the Reactor Trip under WR 03284C. It was determined by IAE personnel that the failure mechanism was a "33 cell switch" EIIS:33!. The cell switch is a Westinghouse type W-2 Reactor Trip Breaker Cell Switch which provides indication of the Reactor Trip Breaker position (racked in or racked out).

IAE personnel placed SSPS Train B back in service to allow OPS Control Room personnel to exit the TS Action Statement and at 1830, OPS Control Room personnel exited TS Action Statement No. 14.

The failed "33 cell switch" was replaced with a new switch which was functionally verified by IAE personnel.

After replacing the "33 cell switch", IAE personnel satisfactorily completed testing of SSPS Train B.

On October 14, 1990, at 1825, OPS Control Room personnel returned Unit 1 to Mode 1.

Conclusion

This event has been assigned a cause of Equipment Failure/Malfunction because of the failure of the "33 cell switch."

IAE personnel had placed BYA in the "test" position as part of the SSPS testing process. With BYA in the "test" position, it was physically

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disconnected from the power bus EIIS:BU! and was not in contact with the "33 cell switch." This "test" position allows BYA to be tested (opened and closed) using auxiliary contacts. However, when IAE personnel attempted to close BYA in "test," it generated an "SSPS General Warning" on Train A. Since Train B was already showing an "SSPS General Warning" signal as part of the SSPS testing, the second "General Warning" signal caused the Reactor to trip. The "General Warning" signal indicates the loss of a protective function of the SSPS.

As part of the troubleshooting process, the recorder used to measure the time response was attached to the set of contacts within the "33 cell switch" that give the "General Warning" signal. When BYA was cycled on two occasions, IAE personnel discovered that the contacts opened for approximately 30 milliseconds, just long enough to generate the "General Warning" signal on Train A. IAE personnel then racked BYA in and out, then back to the "test" position. BYA was again cycled several times in

"test"; however, IAE personnel were not able to generate any subsequent "General Warning" signals. IAE and MES personnel suspect that the movement of closing BYA caused the contacts to be jarred or bounced, allowing them to open slightly. MES personnel noted that the contact surface area between the contact pin and roller is very small and any particulate matter, notably dust, or slight corrosion of one or both of the contact surfaces could prevent the contacts from making a smooth connection. Therefore, any jarring or bouncing could cause the continuity to be broken between the contacts.

Past maintenance performed on the switches approximately 2 years ago included replacing the switches on the Main and Bypass Reactor Trip Breakers on Unit 1 and the Main Reactor Trip Breakers on Unit 2. The switches were changed out because of a problem with the deformation of a cell switch spring retainer. Westinghouse Electric Corporation notified the NRC, pursuant to the requirements of 10CFR Part 21, of the failure of the type W-2 switch that was being used as a circuit breaker cell switch.

As part of the planned corrective action, the failed "33 cell switch" will be sent offsite for further failure analysis, and MES personnel will submit a Station Problem Report (SPR) to pursue replacement of the switches with better type switches which can be used for low voltage applications.

A review of the Operating Experience Program data base for the past 24 months prior to this event revealed one event involving a Reactor Trip as a result of an Equipment Failure. Licensee Event Report (LER) 369/89-22 documented a Reactor Trip because of a failed Universal Board in the SSPS on Train A. The corrective action for this LER was specific to this event. Further research revealed LER 369/88-41, which documented an inadvertent Unit 1 Main Feedwater (CF) System EHS:SJ! isolation caused by an inadvertent action with a malfunctioning switch. The switch involved was a Westinghouse type W-2 switch. This event is therefore considered to be a recurring problem.

This event is Nuclear Plant Reliability Data Systems (NPRDS) reportable. An industry search revealed five Westinghouse type W-2 switches that have

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failed. Three failures were attributed to faulty contacts, one failure resulted from a defective star wheel cam, and one failure was due to the deformation of a cell switch spring retainer.

There were no personnel injuries, radiation overexposures, or uncontrolled releases of radioactive material as a result of this event.

CORRECTIVE ACTIONS:

Immediate: OPS personnel implemented procedure EP/1/A/5000/01, Reactor Trip or Safety Injection, and then entered procedure EP/1/A/5000/1.3, Reactor Trip.

Subsequent: IAE personnel replaced the failed "33 cell switch."

Planned: 1) MES personnel will send the failed "33 cell switch" offsite for failure analysis.

2) MES personnel will submit an SPR to pursue replacing "33 cell switches" with better type switches used for low voltage applications.

3) Transmission personnel will evaluate optimizing the testing process used on the Reactor Trip Breakers.

4) IAE personnel will discontinue time response testing of the Bypass Reactor Trip Breakers during SSPS testing.

5) IAE personnel will discontinue the use of the portable recorder and start using the Event Recorder during SSPS testing.

SAFETY ANALYSIS:

The Reactor Trip was caused by a spurious alarm EIIS:ALM! received during testing of the SSPS. The alarm was received because the SSPS sensed an abnormal unit condition and responded to that condition as required by sending a signal to the Main and Bypass Reactor Trip Breakers. The Breakers in turn, responded by performing their function, by opening.

All plant Safety Systems responded as required where necessary. A Lo-Lo S/G level signal was received which initiated the CA pumps. Lifting of the Pressurizer (PZR) Code Safety Valves EIIS:V!, PZR Power Operated Relief Valves, (PORVs) EIIS:RV!, S/G PORVs, and Main Steam Line Code Safety valves was not required. The Steam Dumps to the Condenser EIIS:COND! opened as required. The Atmospheric Steam Dumps did not and were not required to lift.

All Primary and Secondary system parameters necessary to achieve a Safe Shutdown were at or approaching no-load conditions approximately 30

minutes after the Reactor Trip. Emergency Core Cooling and emergency power were not

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required and were not actuated. The event presented no hazard to the integrity of the plant.

There were no radiological consequences as a result of this trip. The health and safety of the public were not affected as a result of this event.

ADDITIONAL INFORMATION:

Sequence of Events:

PR - Personnel Recollection
PTR - Post Trip Review Report
SSL - Unit 1 Shift Supervisor's Logbook
PIR - Problem Investigation Report
WR - Work Request

Date Time Event

10/13/90 1033:47 Reactor Trip/Turbine Trip occurred on a first out alarm "SSPS General Warning - Rx Trip" signal. (PTR)

1035:41 A lo-lo S/G level signal actuated the CA pumps to start. (PTR)

---- OPS Control Room personnel implemented the Reactor Trip/Safety Injection procedure and then entered the Reactor Trip procedure. (SSL)

---- OPS personnel implemented the Unit Fast Recovery procedure to recover from the Reactor Trip. (PR)

1142 TS Action Statement No. 14 was entered since SSPS Train B was not returned to service within the required 2 hours. (SSL)

1200 OPS personnel made the required notification to the NRC. (PIR,PR)

approx. 1430 IAE personnel began troubleshooting the exact cause of the Reactor Trip. (PR)

1830 OPS Control Room personnel exited TS Action Statement No. 14 once SSPS Train B was returned to service.
(SSL)

---- IAE personnel replaced the failed cell switch and functionally verified the replacement switch.
(PR,WR)

10/14/90 1825 OPS Control Room personnel returned Unit 1 to Mode 1.
(SSL)

ATTACHMENT 1 TO 9011190289 PAGE 1 OF 1

Duke Power Company (704)875-4000
McGuire Nuclear Station
12700 Hagers Ferry Road
Huntersville, NC 28078-8985

DUKE POWER

November 12, 1990

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station Unit 1
Docket No. 50-369
Licensee Event Report 369/90-27

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/90-27 concerning a Solid State Protection System general warning Reactor Trip. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

T. L. McConnell

DVE/ADJ/cbl

Attachment

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